

CLAIMS

I claim:

1. A multiplicity of sets of brass-wind mouthpieces, in which each mouthpiece body includes contiguously conjoined elements of a rim, a cup-chamber, a backbore-chamber, and an external end-taper, and wherein improvement within each separate set comprises:
 - a. a plurality of mouthpiece bodies each having separate lengths, respectively,
 - b. said plurality of mouthpiece bodies each having separate volumetric cup-chamber sizes, respectively,
 - c. said plurality of mouthpiece bodies each having said separate lengths and said separate volumetric cup-chamber sizes juxtaposed so:
 - (1) shorter separate lengths have larger volumetric cup-chamber sizes, respectively,
 - (2) longer separate lengths have smaller volumetric cup-chamber sizes, respectively,whereby changes in timbre of sound are strongly correlated with systematic changes in mouthpiece length and cup-chamber depth, and, whereby musicians can use the visual cue of incremental lengths to aid the selection of mouthpieces.
2. The multiplicity of sets of brass-wind mouthpieces of Claim 1 wherein separate pluralities of said sets thereof have a separate range of sizes that match each respective type of:
 - (a) trumpet,
 - (b) cornet,
 - (c) flugelhorn,
 - (d) french horn,

- (e) baritone horn,
- (f) euphonium,
- (g) trombone,
- (h) sousaphone,
- (i) tuba,
- (j) alto horn,
- (k) tenor horn,
- (l) mellophone,
- (m) bass trumpet,
- (n) wagner tuba,
- (o) similar unnamed brass wind instrument,

to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby musicians for each kind of brass wind instrument can benefit from the improvements that accompany the use of inversely-proportioned mouthpieces.

3. The multiplicity of sets of brass-wind mouthpiece of Claim 1, considered separately, further including divisible sections for:

- (a) said rims,
- (b) said cup-chambers,
- (c) said backbore-chambers,

detachably maintained together by fastening means, to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby rims, cup-chambers and backbore-chambers may be interchanged to compensate for small acoustic variations that exist among similar instruments, to convert sectioned mouthpiece components from prior-art into inversely-proportioned mouthpieces, and to allow for individual preferences amongst musicians.

4. The multiplicity of sets of brass-wind mouthpiece of Claim 1, considered separately, further including divisible sections for:
 - (a) top-sections,
 - (b) said backbore-chambers,detachably maintained together by said fastening means, to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby top-sections and inversely-proportioned backbore-chamber sections may be interchanged to compensate for small acoustic variations that exist among similar instruments, and to convert sectioned mouthpiece components from prior-art into inversely-proportioned mouthpieces.
5. The multiplicity of sets of brass-wind mouthpiece of Claim 1, considered separately, further including divisible sections for:
 - (a) said rims,
 - (b) bottom-sections,detachably maintained together by said fastening means, to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby various rims and bottom sections may be interchanged, and to allow prior-art rims to attach to inversely-proportioned bottom-sections.
6. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein said each mouthpiece body has a substantially similar volumetric size for combined regions of said cup-chamber and said backbore-chamber, respectively, to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby constancy of internal volume help perfect intonation qualities of mouthpieces within each interrelated set.

7. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein said each mouthpiece body has a substantially similar fundamental frequency of resonance when each mouthpiece body is closed at its large end, respectively, to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby a similar resonant frequency helps perfect the intonation qualities of each mouthpiece within each interrelated set.
8. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein said each mouthpiece body has fine-tuned characteristics as produced by second means of making small adjustments to each mouthpiece body, until said fine-tuned characteristics of each mouthpiece body is judged equivalent to other members of a set from which each mouthpiece body is particularly associated, respectively, to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby during a musical performance, one fine-tuned mouthpiece may be quickly exchanged with another fine-tuned mouthpiece from the same set, without having undesirable effects upon basic tuning of an instrument.
9. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein a 12-step method is utilized to calculate a length L3 for said each mouthpiece body by third means of holding constant a predetermined total internal volumetric-size such that:
 - a. v1 represents said predetermined total internal volumetric-size,
 - b. v2 represents internal volumetric size for a predetermined size of said cup-chamber,
 - c. v1 minus v2 determines volumetric size v3 of said backbore-chamber,
 - d. d1 represents a predetermined center-bore diameter,

e. d_2 represents a predetermined hole diameter at the small end of said each mouthpiece body,

f. backbore-chamber length $L_2 = \frac{3(v_3)}{3.1416(R^2 + rR + r^2)}$ where $r = \frac{1}{2} d_1$
 $R = \frac{1}{2} d_2$

g. said length $L_3 =$ said cup-chamber length $L_1 + L_2$,

to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby a relatively simple method helps skilled artisans shape several hundred inversely-proportioned mouthpieces into dozens of correlated sets, for all of the different kinds of brass wind instruments.

10. The 12-step method of Claim 7 further including fourth means for systematically re-proportioning said length L_3 for said each mouthpiece body, respectively, to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby the 12-step method is altered to meet the desires of trombonists and similar musicians while maintaining many benefits of the principle of inverse proportionality.

11. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein an empirical method determines a length of said each mouthpiece body by fifth means of experimentally mating a predetermined size for said cup-chamber to separately varied increments of length for said backbore-chamber section that result in musically useful combinations, respectively, to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby musically useful versions of inversely-proportioned mouthpieces may be determined without the necessity to perform mathematical calculations for internal volumetric size.

12. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein predetermined said lengths have volumetric sizes of said cup-chambers and of said backbore-chambers determined by sixth means of
- a. establishing predetermined L3 lengths substantially different than widely accepted music-industry standards for brass-wind mouthpiece lengths,
 - b. encoding into a computer-aided-design software program predetermined external dimensions with dimensions of said rim for said each mouthpiece body,
 - c. encoding predetermined constants d1, d2, and v1, as substantially fixed design parameters,
 - d. experimentally varying cup-chamber length L1 and backbore length L2 until volumetric chamber sizes of $v2 + v3 = v1$, as calculated by said computer-aided-design software program, where $L1 + L2$ equals L3,
 - e. producing additional mouthpieces by varying rim shapes and cup-chamber diameters while holding constant volumetric size v2,
- to provide an alternative recitation of the elements in the parent claim plus one or more new element(s),

whereby reverse engineering methods create inversely-proportioned mouthpiece designs using predetermined increments of said lengths that are longer and/or shorter than prior-art-lengths.

13. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, further including a seventh means of adjusting the size for said backbore-chambers in approximately direct proportion to a matching adjustment of size for said cup-chambers, respectively, to provide an alternative recitation of the elements in the parent claim in a narrower fashion,

whereby the older techniques of direct proportionality are used to adjust inversely proportioned mouthpieces, to meets the needs of particular musicians, or to meet acoustics needs of different brands of instruments.

14. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, wherein,
- a. successively larger volumetric sizes of said cup-chambers have successively larger diameters for said cup-chambers,
 - b. successively smaller volumetric sizes of said cup-chambers have successively smaller diameters for said cup-chambers,
- to provide an alternative recitation of the elements in the parent claim in a narrower fashion,
- whereby a smaller set of mouthpieces can be constructed that provides better satisfaction to retailers of such sets by helping keep inventory costs low.
15. The multiplicity of sets of brass-wind mouthpieces of Claim 1, considered separately, including an external decorative region for said mouthpiece bodies, to provide an alternative recitation of the elements in the parent claim in a narrower fashion.
16. A mouthpiece for a brass wind instrument having a shape defined by eighth means of applying the principle of inverse proportionality to determine acoustically balanced sizes for a cup-chamber and a backbore-chamber, in a substantially non-standard length of mouthpiece body,
- whereby a musician may benefit from advantages that accompany an inversely-proportioned mouthpiece and,
- whereby multiple mouthpieces of this type can form a set in which synergistic correlations can be discerned amongst cup-chamber sizes, lengths, and variations in timbre of sound.